Course Syllabus
FS 432: Food Engineering
Spring 2014

Instructor: Dr. Helen Joyner
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Office hours: MW 12:30-1:30 PM
or by appointment

Class Hours: MWF 9:30-10:20 AM
Classroom: ALB 212 (UI Campus)
FS 433 Lab Instructor: Frank Younce
Lab Hours: RF 2:10-5:00 PM
Classroom: FSHN 103/155
(WSU Campus)

Course Prerequisites:
WSU: FS 303; PHYSICS 101
UI: FS 302, FS 303, PHYS 111

Course Description:
WSU: Food engineering for improving the efficiency of food processing operations and quality processed food; heat transfer, stream, air-vapor mixtures, refrigeration and fluid flow. Cooperative: Open to UI degree-seeking students
UI: Fundamentals of food engineering for improving the efficiency of food processing operations and the quality of processed food. Principles of heat transfer, steam, air-vapor mixtures, refrigeration and fluid flow as applied to food processing and storage. Cooperative: open to WSU degree-seeking students.

Required Textbook:
Introduction to Food Engineering, 4th ed. RP Singh and DR Heldman (2008). ISBN 9780080919621
The textbook is available at the University of Idaho bookstore or online.
Textbook corrections are available at: http://rpaulsingh.com/textbook/errata_ife.html

Course Website:
https://bblearn.uidaho.edu Log in with your University of Idaho NetID and password. Course announcements, homework assignments, handouts, and quizzes will be available on the website.

Student Learning Outcomes:
Upon successful completion of this course, students will be able to:
1. Calculate mass and energy balances for a given food process.
2. Analyze unit operations and estimate fluid, heat, and mass transfer for a given food process.
3. Design unit operations and flow systems for food products based on given product specifications.

Student Learning Goals Table

At the end of this course, students should be able to:		Course topics (&dates) that advance these learning goals:	This objective will be assessed primarily by:
LO1	**Use critical and creative thinking skills to solve real-life engineering problems and evaluate the accuracy of**	Case studies on mass balances (01/27), fluid flow (02/19), heat transfer (03/27), mass transfer (04/14), dehydration (04/30)	Case studies, quizzes, exams, exam corrections
LO2	**Solve quantitative problems by applying concepts taught in class and making appropriate assumptions**	Mass and energy balances (01/22-01/27), fluid flow (01/29-02/19), heat transfer (02/21-03/10), refrigeration (03/24-03-28), psychrometrics (03/31-04/04), mass transfer (04/07-04/14), evaporation and dehydration (04/16-04/30)	In-class activities, homework assignments, quizzes, exams
LO3	**Develop depth and breadth of food science knowledge, and integrate material taught in other food science courses to benefit themselves, their employers, and the community**	All course topics involve integration of previously learned material (food processes, food chemistry, etc.). The information given in the beginning of the course is a foundation for the information taught later in the course.	All graded assessments

Grade Determination:

Three Midterms @100 points each	300	90-100% = A
Comprehensive Final (optional)	200	80-89.4% = B
Homework sets and case studies	100	70-79.4% = C
Quizzes	50	60-69.4% = D
Class participation	150	<60% = F
Total Points:	800	

Class Participation:

Class participation comprises the following:

Attendance**:**

Attendance is essential to your success in this class. Therefore, students are expected to attend all classes. Excused absences include university-sanctioned events, illness and family emergencies. Students should become engaged in interactive learning processes, participate in classroom discussions, and ask questions when a particular topic or point is unclear. Appropriate professional behavior demonstrating respect for fellow students and instructor is expected.

Stick questions**:**

Stick questions will be asked to encourage student participation, feedback, and critical thinking. Each student will have their name written on a Popsicle stick at the beginning of the semester. Sticks will be chosen at random for answering questions, explaining concepts, reporting on group discussions, etc. Student responses will be tracked on the sticks via a marking system.

Grade Determination (continued):

Phone clicker questions**:**

Students will be required to answer questions asked via PollEverywhere, an online polling service that allows participants to answer questions by texting to a shortcode. This service is free to students and does not require a smartphone to use. Students will be required to certify their phones at the beginning of the semester so that they can receive credit for their answers. Phones can be registered and certified at http://www.polleverywhere.com/register?p=2ftem-1i2w. If any difficulties in using the polling system arise, the instructor should be notified immediately.

NOTE: The maximum number of points given for class participation is 150. However, the total number of available points for class participation is greater than 150. This is to encourage students to answer questions and offer opinions without fear of negatively affecting their final grade.

Late Submission and Make-up Policy**:**

Homework assignments will be due at 5 PM one calendar week from the date of announcement or distribution. Case study write-ups will be due the lecture period after the case study is covered. Late assignments will be accepted at a cost of 20% off the grade per each late day. Therefore, if the assignment is one (1) day late, the highest attainable grade will be 80%. Assignments missed due to a valid University excuse will not be considered late, provided that proper documentation of the reason the assignment was missed is submitted with the assignment.

Make-up of missed exams is contingent on making arrangements prior to the exam. Student must notify instructor of any unforeseen circumstance resulting in a missed exam at least 24 hours before the exam. The type of make-up exam will be oral, essay, or a combination of the two types. The make-up exam must be completed within one week of scheduled exam time.

Quizzes, Homework, and Case Studies**:**

Quizzes will be given every week on the course website and will be open note/book. The lowest quiz grade will be dropped and replaced with the average quiz grade. Required format and a grading rubric will be distributed for homework assignments.

Case studies will be handed out during lecture. Students will be split into groups to work on the case study. Groups will select a member to prepare a write-up summarizing the case study, including answers to questions and calculations performed, for the group. All group members' names must be on the write-up. Each student will be responsible for one write-up during the course (i.e. the same student can't be chosen twice to prepare the write-up).

Midterm Corrections for Credit**:**

Partial credit on the initial scoring of midterms will NOT be given. Students will have the opportunity to regain a portion of points missed on the midterms by resubmitting corrected solutions to the instructor no later than one (1) week after the graded midterms are returned. Credit awarded for correct resubmissions will not exceed one-half (0.5) of the points originally assigned to the problem. To obtain maximum points for a missed problem, the error must be identified and classified (conceptual, mathematical, etc.). The problem must be fully reworked or rewritten with the correct

Grade Determination (continued):

Midterm Corrections for Credit**:**

solution clearly identified. This opportunity to make up points will not be offered for quizzes, homework, and the final exam.

Reading Assignments:

You are expected to complete the assigned reading prior to the class period in which it is to be discussed. This practice will permit the instructor to expand on and clarify the topics. Unannounced quizzes may be given if it becomes apparent that the reading is not being accomplished. Reading ahead is encouraged.

Calculator:

A scientific calculator capable of natural logarithms is required for the homework, quizzes and exams. You need to always bring this calculator to class (and lab).

Students With Disabilities:

WSU: Reasonable accommodations are available for students with a documented temporary or permanent disability. If you have a disability and may need accommodations to fully participate in this class, please visit the Access Center (Washington Building 217) to schedule an appointment with an Access Advisor. All accommodations MUST be approved through the Access Center.

UI: Reasonable accommodations are available for students who have documented temporary or permanent disabilities. Please notify your instructor(s) during the first week of class regarding accommodation(s) needed for the course. All accommodations must be approved through Disability Support Services located in the Idaho Commons Building, Room 306; phone 885-6307; email at dss@uidaho.edu; website at www.access.uidaho.edu or www.webs.uidaho.edu/taap.

Campus Safety:

Washington State University is committed to maintaining a safe environment for its faculty, staff, and students. Safety is the responsibility of every member of the campus community and individuals should know the appropriate actions to take when an emergency arises. In support of our commitment to the safety of the campus community, the University has developed a Campus Safety Plan, http://safetyplan.wsu.edu. It is highly recommended that you visit this web site as well as the University emergency management web site at http://oem.wsu.edu/emergencies to become familiar with the information provided.

Academic Honesty:

Students who violate WSU's or UI's Standards of Conduct for Students will receive an F as a final grade in this course, will not have the option to withdraw from the course and will be reported to the Office of Student Standards and Accountability. Cheating is defined in the Standards for Student Conduct WAC 504-26-010 (3). It is strongly suggested that you read and understand these standards: http://conduct.wsu.edu/default.asp?PageID=338.

Plagiarism:

Plagiarism is defined by Webster's Dictionary as, "*to steal and pass off the ideas or words of another as one's own*." There are two general forms of plagiarism:

(a) Unintentional: the use of other writers' words, phrases, sentences, paragraphs as though they were your own *without understanding* the need to cite the original source. Unintentional plagiarism normally occurs when the individual does not understand the conventions of scientific writing and the need to cite sources of information.

(b) Intentional: the use of another writers' work and claiming it as your own. Intentional plagiarism includes *knowingly copying* or incorporating sections of books, articles, or other sources into your work without citation.

To evade plagiarism, you must acknowledge the source of information. In scientific writing, this can be performed in the text of your work through the use of surnames of authors and the year of publication (*e.g.*, Smith et al., 2003) or by using numbers enclosed by parentheses, which correspond to specific citations in the reference section. In addition to employing citations in the text, plagiarism can be avoided by applying special techniques when writing about information obtained from a source:

(a) Paraphrase: rewording information in which you accurately present the main ideas from the source but do so using your own organization, words, and sentence structures.

(b) Summary: a concise statement of the main idea from a section within a source.

(c) Direct quotation: use of quotes surrounding the passage written by another author.

In general, paraphrasing (a) and the use of summary statements (b) are very common techniques used in scientific writing. Use of quotations (c) in scientific writing is rare and should be avoided.

Plagiarism is dishonest and is **not** tolerated. If caught using all or portions of a current or former classmate's writing or other sources of information (*e.g.*, purchase a paper), a grade of "zero" will be given for the exercise. Additional penalties for plagiarism are possible as outlined in the *Washington State University Student Handbook*.

Course Outline (Tentative):

Week	Date	Topic	Reading
1	Jan 15, 17	Introduction, Dimensions, Properties	Chapter 1
2	Jan 22, 24	Thermodynamics: mass and energy balances	Chapter 1
3	Jan 27, 29, 31	Mass balance case study Thermodynamics: energy balances; Fluid Flow: flow profiles,	Chapter 2, posted reading
4	Feb 3, 5, 7	Fluid Flow: flow measurement, Reynold's number, Bernoulli equation, energy balances for fluid transport systems	Chapter 2, posted reading
5	Feb 10, 12, 14	**Midterm Exam #1** Fluid Flow: energy balances for fluid transport systems Fluid Flow: Pump energy calculation, pump selection	(cumulative*); Chapter 3
6	Feb 19, 21	Fluid Flow case study Energy: steam generation, steam tables, electric power	Chapter 3
7	Feb 24, 26, 28	Heat Transfer: heat exchangers, thermal properties	Chapter 3
8	Mar 3, 5, 7	Heat Transfer: steady-state heat transfer	Chapter 4
9	Mar 10, 12, 14	Heat Transfer: steady-state heat transfer **Midterm Exam #2**	Chapter 4; (cumulative*)
10	Mar 24, 26, 28	Heat Transfer: steady-state heat transfer Heat Transfer: unsteady-state Heat Transfer case study	Chapter 4
11	Mar 31, Apr 2, 4	Heat Transfer review Refrigeration: components, pressure-enthalpy charts, equations	Chapter 4,6
12	Apr 7, 9, 11	Refrigeration: multistage refrigeration Psychrometrics: properties of chart components, chart use and applications	Chapter 6, 9
13	Apr 14, 16, 18	Refrigeration/psychrometrics case study Refrigeration/psychrometrics review Mass Transfer: steady- and unsteady-state transfer	Chapter 6, 9, 10
14	Apr 21, 23, 25	Mass Transfer: steady- and unsteady-state transfer Mass transfer case study	Chapter 8, 10
15	Apr 28, 30, May 2	Evaporation: evaporator types and design **Midterm Exam #3**	Chapter 10 (cumulative*)
16	May 5, 7, 9	Practical Engineering Week	
		Comprehensive Final Exam **Wednesday, May 14, 10:00-12:00 AM**	(cumulative*)

* The exams may include some additional topics from lecture, handouts and/or reading material that may not be covered in the book.
The course outline may be adjusted as necessary to include or exclude topics as time allows.

Assignment and Quiz Schedule

Homework assignments will be given on alternate weeks. Quizzes will be given every week except for midterm weeks. Homework assignments are due on Fridays at the beginning of class. Quizzes will open on the course website on Friday mornings at 10:30 AM and close Monday evenings at 11:59 PM. Case study write-ups are due the lecture period after the case study.

Week	Date	Assignment/Quiz
1	Jan 15, 17	
2	Jan 20, 22, 24	Quiz 1, Homework 1
3	Jan 27, 29, 31	Quiz 2, Mass balance case study
4	Feb 3, 5, 7	Quiz 3, Homework 2
5	Feb 10, 12, 14	**Midterm Exam #1**, Fluid flow case study
6	Feb 17, 19, 21	Quiz 4, Homework 3
7	Feb 24, 26, 28	Quiz 5
8	Mar 3, 5, 7	Quiz 6, Homework 4, Heat transfer case study
9	Mar 10, 12, 14	**Midterm Exam #2**
10	Mar 24, 26, 28	Homework 5
11	Mar 31, Apr 2, 4	Quiz 7
12	Apr 7, 9, 11	Quiz 8, Homework 6
13	Apr 14, 16, 18	Quiz 9, Mass transfer case study
14	Apr 21, 23, 25	Quiz 10, Homework 7
15	Apr 28, 30, May 2	Quiz 11, Dehydration case study, **Midterm Exam #3**
16	May 5, 7, 9	Practical Engineering Week